pharyngeal flap operation has been relatively high, there unfortunately remains a hard core of unsuccessful cases, the reasons for which were unclear until recently. While a number of theories existed as to why the creation of a pharyngeal flap was successful, it has only recently become clear that the sole function of the flap is as an obturator. As a result, it was postulated by several workers in 1972 that the success or failure of the pharyngeal flap was directly related to the adequacy of lateral pharyngeal wall motion. Numerous studies have since confirmed this postulate and it has been clearly shown that postoperative results following a pharyngeal flap operation are based entirely on the adequacy, or lack thereof, of lateral pharyngeal wall movement.

Shprintzen in 1979, Argamaso in 1980 and Daniller and colleagues have shown that the use of preoperative planning allows for the creation of pharyngeal flaps tailormade to the size, shape and location of the velopharyngeal gap. Using a combination of videofluoroscopy and fiberoptic nasendoscopy, it is possible to tailor a wide flap where there is minimal or no lateral pharyngeal wall movement, a narrow flap for situations where there is extremely good lateral pharyngeal wall movement as commonly seen with submucous clefts.

While a combination of multiview videofluoroscopy and nasopharyngoscopy is the best way of obtaining accurate preoperative information, in an average practice it is logistically easier to obtain accurate nasendoscopy information than it is to obtain a combination of the two techniques. Use of a flexible fiberoptic nasopharyngoscope has greatly increased the ability to make accurate preoperative diagnostic judgments on the function of the velopharyngeal port and it can be done easily in an office setting.

Whereas no one flap has been found to be superior to another, it has been possible to tailor the size of flaps by reducing the amount of postoperative tubing. A flap that undergoes very little tubing will remain broad; one that is allowed to tube will basically become fairly narrow. Lack of tubing can be predicted when the superiorly based pharyngeal flap is of the sandwich variety. A superiorly based musculomucosal flap is raised in a routine manner and then sandwiched into a pocket created in the soft palate that extends from one tonsillar pillar to the other. The tubing effects on the broad, relatively short, unattached segment have been less pronounced than those observed with other varieties of superiorly based pharyngeal flaps. With the use of a 3-mm fiberoptic nasendoscope and topical anesthetic, it is possible to examine even very young children and obtain very high success rates. Thus, using careful preoperative nasendoscopy planning, it is possible to successfully treat patients with velopharyngeal incompetence, reducing persistent postoperative velopharyngeal incompetence to a minimal level. A secondary pharyngeal flap surgical procedure, while not impossible, can be extremely difficult. Reducing the chances of failure by using careful preoperative diagnostic planning has dramatically reduced the necessity for a second operation.

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Collagen

SINCE 1977 when Knapp and others reported their preliminary work on the use of injectable collagen, a large number of patients have been treated in an attempt to correct a variety of textural and contour problems with various degrees of success and permanence of results.

The collagen implant, supplied as a dispersion in preloaded sterile syringes, is injected into the superficial dermis through a 27- or 30-gauge needle using a multiple-puncture technique. The material is suspended in saline and 0.3% lidocaine and is provided in two concentrations of 35 and 65 mg per ml. Studies in animals and human tissue biopsy specimens indicate that the collagen mass condenses into a cohesive implant that serves as a matrix for the ingrowth of fibroblasts and capillaries.

Before treatment, an intradermal skin test is administered on the forearm and the site is observed for four weeks to determine if any sensitivity develops. A positive skin test has been observed in 3% of recipients; they, of course, are not treated. Patients with a history of autoimmune disease or a strong allergic history should not be treated. After a negative skin test, injections are given at two- to four-week intervals, overcorrecting to 150% to 200% each time. Usually three to four sessions are required.

It is important that the texture, contour and induration of the lesion to be treated be carefully considered. Small cutaneous depressions, scars from acne, surgical procedures and trauma, depressed skin grafts and some of the changes, wrinkles and depressions due to the aging process have been treated successfully. Sharply marginated lesions such as chickenpox scars or the "icepick" scars of acne are difficult if not impossible to treat. Steroid atrophy, linear scleroderma, hemifacial atrophy and some of the residual contour abnormalities associated with cleft lip have been treated experimentally. Scars that are soft, distensible and nonstressed respond well, whereas those that are excessively firm, indurated or nondistensible do not. Occasionally, very firm areas will soften under treatment.

Problems and complications such as local tissue reaction, infection or laceration of a superficial tiny blood vessel occur in less than 1% of patients. The development of sensitivity or an allergic response during the course of treatment is also less than 1%. Significant, severe or systemic complications are rare. A single case

of occlusion of an intraocular vessel has occurred with a periorbital injection.

The long-term results of collagen injections to correct contour deformity vary with the type of lesion, tissue stress and unknown factors related to collagen turnover. Patients are advised that the permanence of the correction cannot be predicted and that some subsidence will occur. Supplemental injections may be required to maintain adequacy of results; however, good results without reinjection have occurred in a significant number of patients for as long as two to four years.

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Refinements in Tissue Expansion

TISSUE EXPANSION represents a physiologic phenomenon that emphasizes the principle that tissue can accommodate to a slowly enlarging mass by increasing its surface area. Developmental expansion of breast tissue or the cyclical enlargement of abdominal girth by a growing fetus are pertinent examples of natural tissue expansion.

"Controlled" tissue expansion was popularized by the innovative developments, begun by Dr Chedomir Radovan in 1976, for adjacent flaps in breast reconstruction. Since then, the use of tissue expansion in reconstructive surgery has sharply widened in both clinical and research areas.

Tissue expansion is a two-staged technique initiated by placing a temporary expandable silicone implant beneath normal tissue, usually adjacent but, on occasion, distant to a defect. As the silastic balloon is enlarged by the incremental addition of sterile saline, the overlying tissue gently "expands" and is available for use after implant removal. Tissue expansion should be considered an *aesthetic* alternative in reconstructive surgical procedures, specifically in those areas where previous techniques have not provided consistent aesthetic or functional results. Because of its versatility, safety and simplicity, tissue expansion may be better tolerated in patients where more sophisticated and complicated procedures may prove to be a substantial challenge to the patient's problem.

Advantages

- Minimal donor defect.
- Provides "like" characteristics, such as color, sensation, hair.
- Provides highly vascularized tissue—that is, delay phenomenon.
- Simple, reliable, safe and versatile.

Clinical Usage

- Head and neck reconstruction—that is, scalp, nose, external ear, mandible, congenital nevi and hemangiomas, traumatic and cosmetic defects and burn contractures.
- Breast reconstruction for Poland's syndrome, postmastectomy.
- Trunk and perineal reconstruction for burn contracture, abdominal wall defects, pressure sores and the like.
- Extremity reconstruction for pressure sores, traumatic defects and so forth.

Preventing complications remains the key to reducing the rates of major and minor complications. These include proper patient and defect selection, refining operative techniques and improved product modification. The common complications of tissue expansion include exposure or deflation of implant and valve, infection, skin necrosis, compression of adjacent structures and hematoma or seroma.

With any innovative reconstructive procedure, a period of enthusiasm is followed by a period of reflection and refinements. The concept and practice of tissue expansion is currently in the latter period of evolution. Its ultimate role in reconstruction will be determined by increased clinical experience and the ingenuity of surgeons.

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Biobrane—A Synthetic Skin Substitute

THE DEVELOPMENT of an artificial skin to replace burn-damaged skin has been a long-held hope. Recent publications in the lay press have brought this research to the attention of the general public and have raised its expectations.

A truly artificial skin would ideally be a *permanent* substitute for a patient's own skin and, as such, should share with skin the characteristics of a protective barrier against bacterial invasion and water, protein and heat loss. The ideal artificial skin would also be flexible, sterile with a long shelf life, low in cost and readily available. In the recent past and at present, the best skin substitutes have been biologic dressings such as amnion and human cadaver allograft. These are expensive, however, must be changed frequently and are not permanent, requiring eventual replacement with autograft.

A commercially available synthetic skin substitute, Biobrane, has been widely used on burned patients as a temporary skin replacement. It has served as a low-cost alternative to human cadaver allograft. The barrier properties of Biobrane are similar to human skin; it is able to withstand bacterial wound contamination as well as fresh human cadaver allograft and is transparent, allowing visualization of the underlying wound.